

# INSTRUCTIONS

CHANGE 3 TO NAVSHIPS 91958(A)

APPROVED 10 September 1956

This permanent change revises the book to reflect equipment changes made by Field Change 2-AN/SPS-5B. It supersedes Change 2-AN/SPS-5B. The Field Change applies to all serial numbers of Radar Set AN/SPS-5B. Its purpose is to provide indication of Voltage Standing Wave Ratio.

This permanent change is in effect after Change 1-AN/SPS-5B, and Field Change 2-AN/SPS-5B have been made. Therefore DO NOT revise the book until Change 1-AN/SPS-5B and Field Change 2-AN/SPS-5B have been accomplished.

1. Remove superseded pages and insert revised pages as indicated below.

<u>Page</u>	<u>Remove</u>	<u>Insert</u>	<u>Page</u>	<u>Remove</u>	<u>Insert</u>
T. P. /A	CH. 1/CH. 1	CH. 3/CH. 3	1-11/1-12	ORIG/CH. 1	CH. 3/CH. 1
i/ii	ORIG/ORIG	CH. 3/CH. 3	2-49	ORIG	CH. 3
v/vi	ORIG/ORIG	CH. 3/CH. 3	3-0	ORIG	ORIG
vii/viii	ORIG/ORIG	CH. 3/ORIG	7-67/7-68	ORIG/ORIG	CH. 3/CH. 3
ix/x	CH. 1/ORIG	CH. 3/CH. 3	7-68A/7-68B		CH. 3/CH. 3
1-9/1-10	ORIG/ORIG	CH. 3/CH. 3	8-OA/8-OJ		CH. 3/CH. 3

2. Make the following pen and ink corrections as indicated.

<u>Page</u>	<u>Location</u>	<u>Action</u>
2-9	Para. 6.b.(2) line 1	Delete "KC" and insert "KV".
2-14	Para. 6.e.(7) line 12	Delete "C331" and insert "C332".
2-17	Para. 6.e.(11)(e)(3) line 2	Delete "B318" and insert "V318".
2-22	Para. 7.c.(7) line 4	Delete "V708A" and insert "V702A".
2-24	Para. 7.d. title	Delete "2-15" and insert "2-16".
2-25	Para. 7.e. title Para. 7.f. title	Delete "2-15" and insert "2-16".
2-27	Para. g. title	Delete "2-15" and insert "2-16".
2-30	Para. 7.h. title	Delete "2-15" and insert "2-16".
2-31	Para. 7.i. title	Delete "2-15" and insert "2-16".
2-34	Figure 2-30	Delete in title "Sircuits" and insert "Circuits".

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Table 8-4, Table of Replaceable Parts, should be corrected with pen and ink as follows:

<u>Page</u>	<u>Action</u>
8-183	Delete "N16-C-73153-3710" in the STOCK NUMBER column opposite Reference Designation L309, and insert "N16-C-73153-5082".
8-289	Delete Raytheon Part number "280-1060P2" in the NAME AND DESCRIPTION column opposite Reference Designation R508, and insert "280-1228P4".
8-292	Delete Raytheon Part number "280-1060P1" in the NAME AND DESCRIPTION column opposite Reference Designation R706, and insert "280-1228P3". Delete N16-R073528-4056 and add N-16-R073285-7946.
8-295	Delete Raytheon Part number "280-1077P6" in the NAME AND DESCRIPTION column opposite Reference Designation R729, and insert "280-1225P13". Delete N16-R073509-1426 and add For Replacement Use SNSN N16-R073237-7818.  Delete Raytheon Part number "280-1077P1" in the NAME AND DESCRIPTION column opposite Reference Designation R731, and insert "280-1225P8". Delete N16-R073477-1326 and add For Replacement Use SNSN N16-R073477-1937.  Delete Raytheon Part number "280-1077P2" in the NAME AND DESCRIPTION column opposite Reference Designation R732, and insert "280-1225P9". Delete N16-R073485-6726 and add For Replacement Use SNSN N16-R072998-1302.
8-296	Delete Raytheon Part number "280-1077P5" in the NAME AND DESCRIPTION column opposite Reference Designation R733, and insert "280-1225P12". Delete N16-R073499-9726 and add For Replacement Use SNSN N16-R073092-6938.  Delete Raytheon Part number "280-1077P3" in the NAME AND DESCRIPTION column opposite Reference Designation R734, and insert "280-1225P10". Delete N16-R073486-6326 and add For Replacement Use SNSN N16-R073003-5232.
8-301	Delete Raytheon Part number "280-1078P1" in the NAME AND DESCRIPTION column opposite Reference Designation R786, and insert "280-1228P1". Delete N16-R073497-6506 and add For Replacement Use SNSN N16-R073073-9125.
8-302	Delete Raytheon Part number "280-1078P2" in the NAME AND DESCRIPTION column opposite Reference Designation R790, and insert "280-1228P2". Delete N16-R073500-1006 and add For Replacement Use SNSN N16-R073092-8932.
8-306	Delete Raytheon Part number "280-1079P1" in the NAME AND DESCRIPTION column opposite Reference Designation R1731, and insert "280-1229P1". Delete N16-R073515-8046 and add For Replacement Use SNSN N16-R073192-4246.



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<u>Page</u>	<u>Action</u>
8-306	Delete Raytheon Part number "280-1058P16" in the NAME AND DESCRIPTION column opposite Reference Designation R1733, and insert "280-1225P15". Delete N16-R050695-0751 and add N16-R073522-6076.
8-323	Delete Raytheon Part number "280-1077P4" in the NAME AND DESCRIPTION column opposite Reference Designation R3727, and insert "280-1225P11". Delete N16-R073489-9426 and add For Replacement Use SNSN N16-R073505-7299.
8-325	Delete Raytheon Part number "280-1077P7" in the NAME AND DESCRIPTION column opposite Reference Designation R3757, and insert "280-1225P14". Delete N16-R073485-2426 and add For Replacement Use SNSN N16-R072995-5066.
3. Destroy superseded pages after the complete book has been checked against the "List of Effective Pages".	
4. Make appropriate entry in "Record of Changes Page".	
5. Insert this "Instructions" sheet just behind the front cover and just before CHANGE 2.	



NAVSHIPS 91958(A)

INSTRUCTION BOOK  
for  
RADAR SET  
AN/SPS-5B

RAYTHEON MANUFACTURING COMPANY  
WALTHAM, MASSACHUSETTS, U. S. A.

DEPARTMENT OF THE NAVY  
BUREAU OF SHIPS

*Contract NObsr-57072*

*Approved by BuShips 30 November 1953*  
*Change 3: 10 September 1956*



## LIST OF EFFECTIVE PAGES

## Replacement Pages

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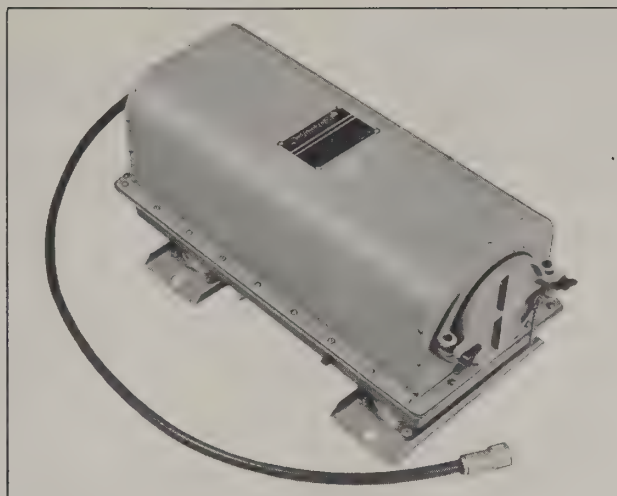


Figure 1-9. Tuned Cavity FR-66/UP.

circuit whose energy storage properties are used to provide an artificial echo on the screen of the PPI tube for tuning the Receiver in the absence of actual targets. The cavity is mechanically tuned to the magnetron frequency each time that a new magnetron is installed. An electric motor is used to tune the cavity back and fourth across the center frequency.

The Tuned Cavity receives its excitation from the Directional Coupler which is permanently installed as a section of the waveguide.

#### i. STANDING WAVE RATIO INDICATOR IM-120/UPM-79 (See Figure 1-10)

The Standing Wave Ratio Indicator is designed for temporary insertion into the slotted section of Directional Coupler CU-245/U (See Figure 1-3) to

provide measurement of the overall standing wave ratio of the waveguide and the Antenna system, and a rough indication of transmitter power level.

Standing Wave Ratio Indicator IM-120/UPM-79 is contained within a metal carrying case AN/UPM-79. Located on the inside of the cover is a crystal holder with five spare IN25 crystals.

#### TABLE 1-1. QUICK REFERENCE DATA

<i>Name and designations of equipment:</i>		
Radar Set AN/SPS-5B		
<i>Contract and date:</i>	NObsr-57072	7 November 1951
<i>Contractor:</i>	Raytheon Manufacturing Company, Waltham, Mass.	
<i>Cognizant Naval Inspector:</i>		
Inspector of Naval Material, Boston, Mass.		
<i>Number of packages per complete shipment (including spares):</i>		
12		
<i>Total cubical contents (without spares):</i>		
Crated: 266.1		
Uncrated: 232.78		
<i>Total weight (without spares):</i>		
Crated: 1675 lb.		
Uncrated: 896 lb.		
<i>Frequency band:</i>	X <sub>B-1</sub>	6275-6575 mc
<i>Type of frequency control:</i>		
Pulse-modulated magnetron oscillator		
<i>Type of emission:</i>	Pulse (0.37 microsecond)	
<i>Peak power output:</i>	170 to 285 kw	
<i>Pulse rate:</i>	683.06 pps	
<i>Type of receiver:</i>	Superheterodyne	
<i>Intermediate frequency:</i>	30 mc	
<i>Bandwidth:</i>	5 mc	
<i>Power supply characteristics:</i>		
<i>Voltage:</i>	104-126 volts AC	
<i>Frequency:</i>	60 ± 2 cycles	
<i>Phase:</i>	Single	
<i>Maximum starting current:</i>	28 amp	
<i>Standby current:</i>	11 amp	
<i>Operating current:</i>	17.5 amp	
<i>Estimated power:</i>	1.7 kw	
<i>Power factor:</i>	91%	



Figure 1-10. Standing Wave Ratio Indicator IM-120/UPM-79, with Carrying Case

TABLE 1-2. EQUIPMENT SUPPLIED

QUAN- TITY PER EQUIP- MENT	NAME OF UNIT	AN TYPE DESIGNATION	OVER-ALL DIMENSIONS (IN IN.)			VOL- UME CU. FT.	WEIGHT LBS.
			HEIGHT	WIDTH	DEPTH		
1	Receiver-Transmitter, Radar	RT-301/SPS-5B	20 $\frac{7}{16}$	21 $\frac{3}{16}$	21 $\frac{3}{4}$	5.58	108
	Receiver Radar Transmitter, Radar	R-585/SPS-5B T-429/SPS-5B					
1	Modulator, Radar	MD-133/SPS-5	16 $\frac{9}{16}$	19 $\frac{1}{4}$	13	2.4	67
1	Indicator, Azimuth Range	IP-249/SPS-5B	25 $\frac{5}{16}$	24 $\frac{1}{8}$	25 $\frac{1}{2}$	8.9	228
1	Power Supply	PP-1026/SPS-5B	28 $\frac{15}{16}$	22	11 $\frac{13}{16}$	4.14	160
1	Antenna	AS-651/SPS-5B	56 $\frac{7}{8}$	Swing Circle	90	208.0	102
1	Control, Antenna	C-1263/SPS-5B	22	18 $\frac{3}{16}$	13 $\frac{3}{4}$	3.0	92
1	Coupler, Directional	CU-245/U	4 $\frac{3}{8}$	3	17 $\frac{1}{2}$	0.13	2.5
1	Cavity, Tuned	FR-66/UP	8	8	17	0.63	22 $\frac{3}{4}$
1	Indicator, Standing Wave Ratio (Field Change 2—AN/SPS-5B)	IM-120/UPM-79	7 $\frac{1}{4}$	9 $\frac{1}{4}$	6 $\frac{3}{4}$	.25	6
TOTAL						233.03	788.25

TABLE 1-3. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED.

Any IFF equipment, switch boards, or remote indicators are Navy supplied as a part of a ship or station system, if used.

Model AN/SPA-8A, AN/SPA-4A, or VK Series remote indicator may be used if a virtual projection reflectoscope (VPR) be needed to operate with the AN/SPS-5B.

Model MX-969/SPA-4A reflectoscope operates with any of the above remote PI indicators, if needed with AN/SPS-5 radar ship system.

Applicable ship or station installation plans reference the necessary drawings or publications required, but not supplied with AN/SPS-5B radar equipments.

TABLE 1-4. SHIPPING DATA

SHIP- PING BOX NO.	QUAN- TITY	CONTENTS		OVER-ALL DIMENSIONS			CRATED	
		NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH	VOL- UME	WEIGHT
1	1	Receiver-Transmitter, Radar including 1 Terminal Kit consisting of: 1 Receiver, Radar 1 Transmitter, Radar 1 Instruction Book 1 set of Lubrication Charts 1 set of Maintenance Drawings 1 Operating Instruction Plaque	RT-301/SPS-5B  R-585/SPS-5B T-429/SPS-5B	32	30	29	16	250
2	1	Indicator, Azimuth-Range, with 1 Terminal Kit at- tached	IP-249/SPS-5B	37	31	27	18	336
3	1	Modulator, Radar, with 1 Terminal Kit attached	MD-133/SPS-5	25	21	18	5.5	115
4	1	Power Supply with 1 Ter- minal Kit attached	PP-1026/SPS-5B	35	26	18	9.5	230



TABLE 1-4. SHIPPING DATA (Cont.)

SHIP- PING BOX NO.	QUAN- TITY	CONTENTS		OVER-ALL DIMENSIONS			CRATED	
		NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH	VOL- UME	WEIGHT
5	1	Antenna Assembly complete and consisting of: 1 Pedestal Assembly with 1 Terminal Kit attached. 1 Reflector, Fog Horn Assembly, and Aligning Braces, plug, hardware. 1 Temporary Mounting Ring	AS-651/SPS-5B	95	50	65	180	375
6	1	Control, Antenna, with 1 Terminal Kit attached	C-1263/SPS-5B	28	23	18	6.8	166
7	1	Echo Box Cavity, Tuned	FR-66/UP	28	18	18	5.3	68
	1	Coupler, Directional	CU-245/U					
8		For use with Azimuth-Range Indicator		33	21	18	7.5	72
	1	Viewing Hood (large) Miscellaneous and Interconnecting Material (For use with Boxes 9 and 10)						
	75'	Cable, Coaxial (Pulse) (For use with Waveguide)	RG-26A/U					
	24	Flanges, Contact						
	12	Gaskets						
	150	Screws, binding head, mach. #10-24 x 7/8" long						
	150	Nuts, hexagon (#10-24)						
	150	Washers, spring lock (#10) (For use with Receiver-Transmitter)						
	1	Connector, Plug (For use with Modulator)	UG-34/U					
	1	Connector, plug	UG-34/U					
	1	Field Change 2—AN/SPS-5B Radar Test Set AN/UPM-79 c/o Indicator, Standing Wave Ratio IM-120/UPM-79 Case, Indicator CY-1978/UPM-79						
9	100 ft.	Waveguide (11 1/2" x 3/4") Alum. in 10 ft. lengths.	RG-106/U	149	6	6	3.1	63
10		Equipment Maintenance		29	19	15	4.8	144
	1	Instruction Book						
	1	Set Lubrication Charts						
	1	Special Tools						
	1	Wrench						
	1	Wrench (socket)						
	1	Tube Gage Assembly						
11		Equipment Maintenance Parts		29	19	15	4.8	141
12		Equipment Maintenance Parts		29	19	15	4.8	139

Unless otherwise stated, dimensions are inches, volume cubic feet, weight pounds.

Volume is computed with all units, assemblies, and miscellaneous parts in transport cases.

TABLE 1-5. ELECTRON TUBE COMPLEMENT

UNIT	NUMBER OF TUBES OF TYPE INDICATED																												Total No. of Tubes				
	OA3/VR75	OD3/VR150	1B50	1B51	1Z2	2K26	3B24W	3B29	4J57	4-65A	5C22	5R4GY	6AG7	6AH6	6AN5	6AN5WA	6A57G	6D4	6J6W	6X4	6Y6G	10KP7	807	5654/6AK5W	5725/6A56	5726/6AL5W	5727/2D21	5814/12AU7		6005	6087/5Y36T	6201/12AT7	
Radar Receiver-Transmitter RT-301/SPS-5B																																	
Radar Transmitter T-429/SPS-5B			1	2	1	1			1												1											1	
Radar Receiver R-585/SPS-5B																	1	1	4						10	5							
Azimuth-Range Indicator IP-249/SPS-5B					1								4	1						1	1	2				2	4	2	2	3		22	
Radar Modulator MD-133/SPS-5B								3	1	1	1				1														1				
Antenna Control C-1263/SPS-5B																														2	2	4	
Power Supply PP-1026/SPS-5B	1	2										5					4				2	5		4						1		24	
Total Number of Each Type	1	2	1	2	2	1	3	1	1	1	1	5	4	1	1	1	1	4	1	4	4	5	1	2	14	2	9	2	3	5	1	25	110



The synchro information supplied by the ship's gyro compass (OSC) is fed to an 18CT6 synchro (B502) in the bearing conversion assembly, which is also driven by the mechanical differential. Error voltage from B502 is fed to the bearing conversion servo amplifier in the American Control Unit, which controls B501 (mechanical differential drive motor). Synchro (B503) now feeds true-bearing information to the 1HCT synchro (B702) in the Indicator. The synchro in the Indicator is mechanically connected to the PPI deflection coil. Error voltage from the 1HCT synchro in the Indicator is fed to a bearing servo amplifier (in the Indicator), which controls the two-phase drive motor (B704) for the deflection coil. The system may be used to indicate relative bearing by switching the information from the Antenna synchro directly to the Indicator synchro by means of a relay, instead of mixing the Antenna synchro information with OSC information in the bearing conversion assembly in the Antenna Control.

The equipment is designed to accept 1-speed synchro data, or step-by-step data. When 1-speed synchro system is use, the OSC data are supplied to B502 only and the gain of the servo amplifier is increased by adjusting R515. In the event that step-by-step data are available, the OSC data are supplied to step motor B507, which is coupled to B508 (an 18TR6 synchro, driven at 1-speed by the step motor). The output of B508 is 1-speed synchro data.

13. RADAR TEST SET AN/UPM-79 (See Figures 2-41 and 2-46)

This indicator provides a means of measuring the standing wave ratio in the waveguide, and the approximate transmitter power level. The standing wave ratio is measured by removing the cover from the waveguide slot, inserting the three probes and the two alignment pins located at the rear of the indicator, into the slot. The probes feed a crystal detector (1N25) and the rectified output operates a meter which indicates the standing wave ratio.

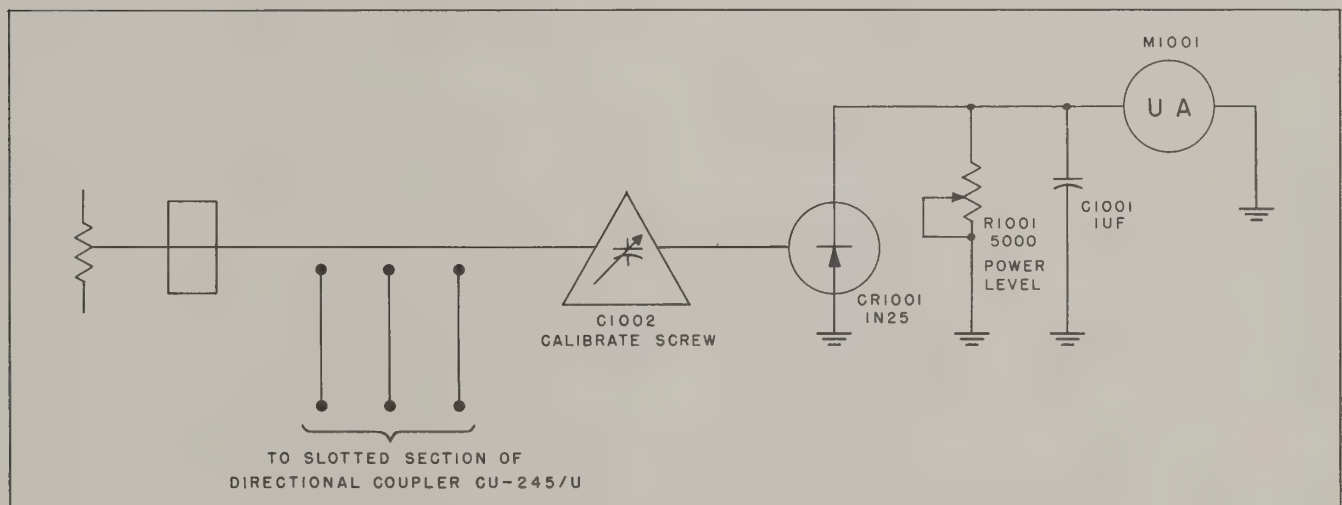
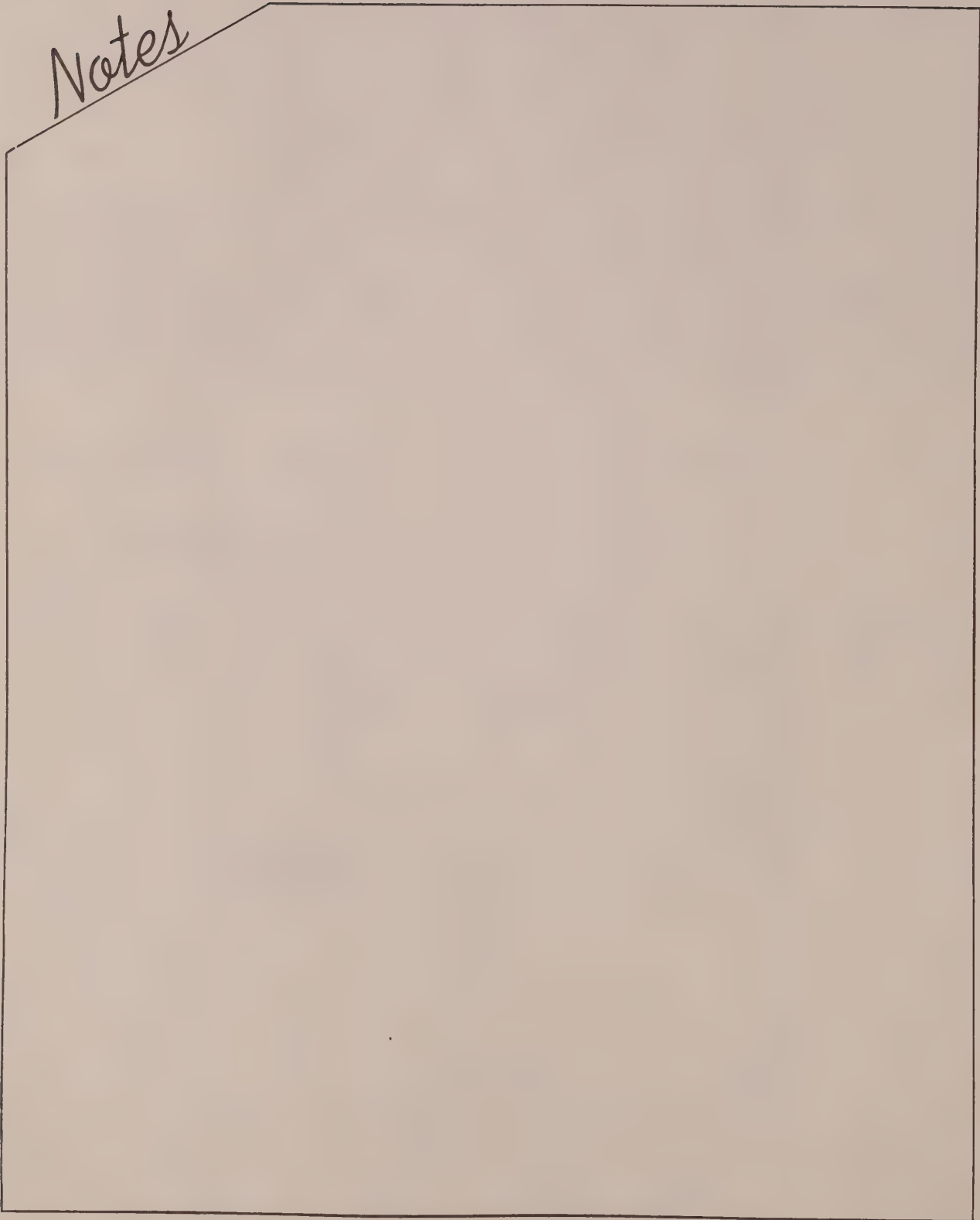


Figure 2-46. Radar Test Set AN/UPM-79: Schematic Diagram

*Notes*





in the waveguide run beyond the Directional Coupler or in the Antenna will not show up in tests of the Tuned Cavity. However, the standing-wave ratio (paragraph 6.f.(2), may serve to indicate faults in the waveguide run or Antenna.

Because a loss in system performance affects the maximum range on small targets (such as a cruiser), the Tuned Cavity provides a much more reliable indication of system performance than can be obtained by the use of targets. Also, it is not affected by weather conditions as are targets. The temperature correction of ringing time is small, although the ringing time may be several hundred yards greater at very low temperatures. However, the effect of humidity is larger, which may cause the ringing time to drop appreciably on very humid days.

*(c) Checking Magnetron Output and Spectrum.*

To check the magnetron output, tune the Tuned Cavity for a maximum indication on the PPI screen on the Indicator. The observed reading is a relative measure of the magnetron output. However, the readings do give an accurate comparison of the outputs from several different magnetrons if they are checked at about the same time.

To check the magnetron spectrum, tune the Tuned Cavity through its entire tuning range. As the Tuned Cavity Tuning Control is rotated in one direction there will normally be at least one minor peak, a major peak, and another minor peak on the other side of the center frequency. These secondary peaks should always be less than one-fourth the amplitude of the major peak and located symmetrically about the center frequency. If several major peaks of approximately the same amplitude are observed, the magnetron is probably defective and should be replaced, after first checking to make sure that the standing-wave ratio at the slotted section is not excessive.

The spectrum can be plotted by recording the ringing time indicated on the PPI screen as ordinates and frequency as abscissas. A magnetron with a poor spectrum may operate satisfactorily on manual tuning but give erratic results on AFC operation.

*(d) Checking Magnetron Frequency for Pulling.*

The Tuned Cavity provides a convenient check for magnetron pulling (variations in output frequency caused by a faulty rotary joint or the presence of very close reflecting objects near the Antenna). This pulling can be a serious difficulty as it may vary the magnetron frequency so rapidly that the AFC circuit cannot maintain the local oscillator in tune, thereby causing poor signals.

To check for pulling, proceed as follows:

1. Measure the ringing time on the Indicator with the Antenna rotating.

**Note**

Variation in ringing time at various bearings indicate pulling of the magnetron, which may be caused by a faulty rotary joint or by reflecting surfaces in the path of the Antenna beam (such as the mast).

2. If variations in ringing time are noted as the Antenna rotates, stop the Antenna on a bearing where the ringing time is reduced and retune the Tuned Cavity for a maximum indication on PPI screen.

3. Rotate the Antenna once more, and using AFC tuning, check the ringing time. If the AFC circuit is following properly, the ringing time should be good on the original bearing. The ringing time may have decreased at those bearings where it was originally good, but this is not significant. If the AFC circuit does not follow, the pulling may be excessive or the AFC circuit may be at fault.

*(e) Checking AFC Locking-In.*

To determine whether the AFC circuit is locked in at the proper frequency, stop the Antenna and tune the Tuned Cavity for a maximum indication on the PPI Screen. With the AFC on, measure the ringing time. Then, with the AFC off, adjust the TUNE Control on the Azimuth-Range Indicator for maximum ringing time. The two ringing times should be identical.

If the ringing time on AFC is even slightly less than on manual tuning, the AFC circuit is probably not centered on the signal IF channel frequency. This misalignment can be caused by incorrect tuning of the local oscillator, the AFC stage or the AFC discriminator stage. However, a bad magnetron spectrum can also cause improper AFC operation and the magnetron should be checked before attempting to align the AFC circuit in the Radar Receiver.

*b. RADAR TEST SET AN/UPM-79.*

*(1) INITIAL CALIBRATION (Refer to Figure 7-60A)*

**Note**

Before using the indicator for the first time, or after changing crystals, make the following initial calibration adjustments.

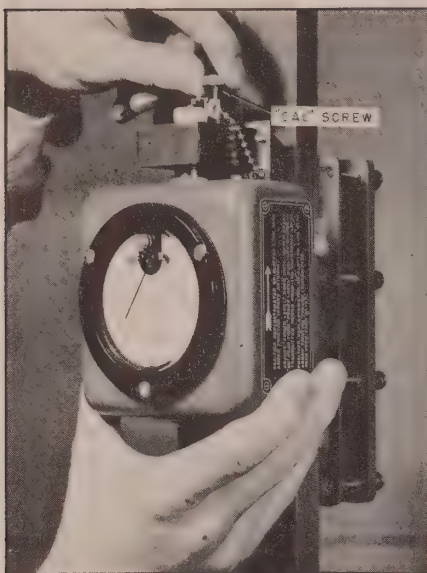
(a) Loosen the eight captive bolts that secure the protective cover plate to the slotted section of Directional Coupler CU-245/U, and remove cover plate.

(b) Energize Equipment.

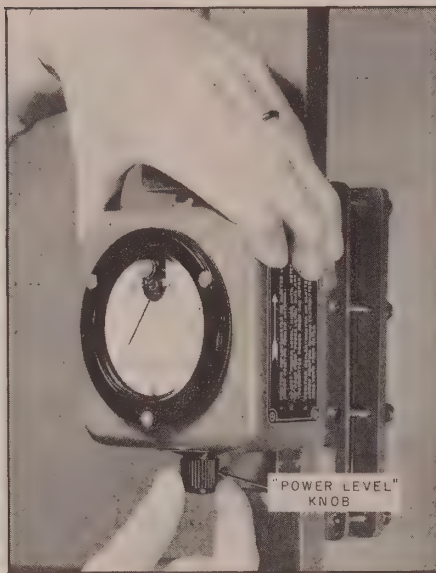
(c) Set "Power Level" knob to zero unless some other reference level is indicated. (See para. 6.b.(3)).

(d) Position VSWR INDICATOR on slotted line with arrow pointing toward antenna.

(e) Loosen locknut slightly, and adjust "CAL" screw until meter reads  $\infty$ . Tighten locknut. Do not touch "CAL" screw during normal operation.



Adjustment of "CAL" Screw



Adjustment of "Power Level" Knob



Reading Standing Wave Ratio

Figure 7-60A. Reflectometer in Position on Slotted Line

**Note**

Always repeat initial calibration procedure after changing crystals. The equipment calibrated, proceed to measure the standing-wave ratio using the following operating instructions.

**(2) OPERATION**

(a) (Refer to Figure 7-60A) Position REFLECTOMETER on slotted line with arrow pointing toward antenna.

(b) Adjust "Power Level" knob until meter reads infinity. Read from "Power Level" dial any change in transmitted power from the reference level.

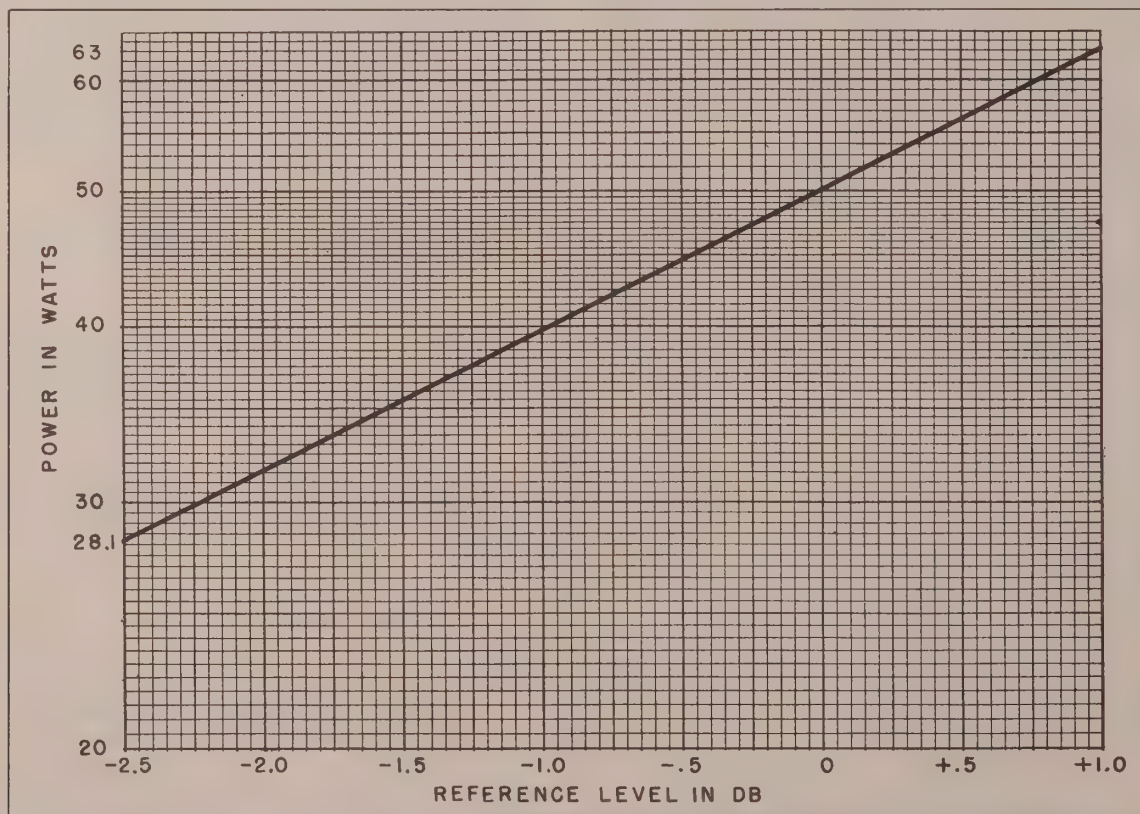
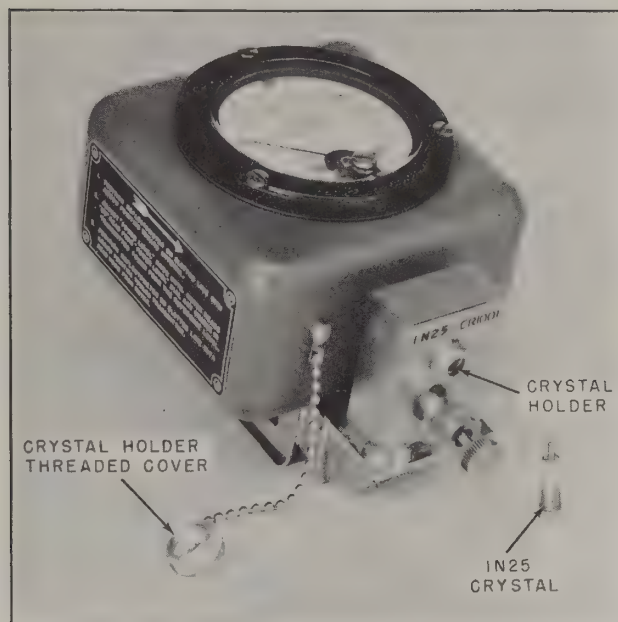


Figure 7-60B. Conversion Graph for use with Standing Wave Ratio Indicator IM-120/UPM-79





**Figure 7-60C. Standing Wave Ratio Indicator IM-120/UPM-79: Replacement of 1N25 Crystal**

(c) (Refer to Figure 7-60A) Position VSWR INDICATOR on slotted line with arrow pointing toward transmitter. Read voltage standing wave ratio from meter.

**Note**

When reading the voltage standing wave ratio, carefully slide the VSWR INDICATOR up and down on the slotted line. Record the average reading.

**(3) ALIGNMENT PROCEDURE (Refer to Figure 7-60B)**

If a water load or other equipment capable of measuring the transmitter average power level is available, the reference level used at the time of initial calibration may be determined from the conversion graph (Figure 7-60B). Measurements of power level made with the VSWR INDICATOR (OPERATION, Step (b)), will then show the comparison between the transmitter power level and the normal power level of 50 watts.

If power measuring equipment is not available when the initial calibration is made, use zero as the reference level. Measurements of power level made with the VSWR INDICATOR (OPERATION, Step (b)), will show the comparison between the transmitter power level and the power level which existed at the time of the latest initial calibration.

**(4) Replacement of 1N25 Crystal (See Figure 7-60C)**

(a) Unscrew the threaded cap from the crystal holder.

(b) Remove the defective crystal.

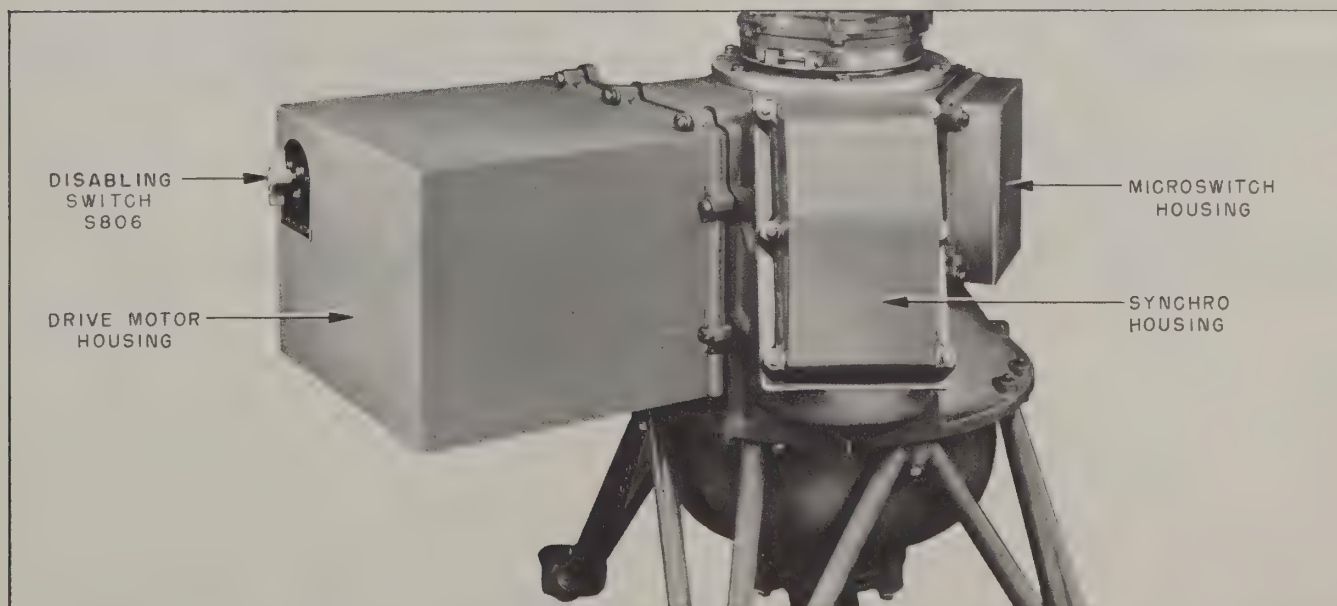
**Note**

Extreme care must be used to prevent damage when replacing crystals. Touch waveguide with finger to remove any static charge before inserting new crystal.

(c) Insert crystal slowly, perpendicular to waveguide.

(d) Gently feel for proper seating before applying light pressure.

(e) Replace the threaded cap removed in step (a), above.



**Figure 7-61. Antenna AS-651/SPS-5B: Pedestal Components**

i. ANTENNA AS-651/SPS-5B.

(1) *General (See Figure 7-61).*

After this unit has been installed and the ship's heading microswitches have been adjusted (as outlined in paragraph 6.b.(6) below) and the synchro system has been aligned, it will only be necessary to check the oil in the base of the Antenna periodically. No extensive servicing should be attempted with the Antenna mounted on the mast.

The following illustrations will aid the technician in trouble shooting in this unit:

Figure 7-79. Antenna AS-651/SPS-5B Schematic Diagram.

Figure 7-87. Antenna AS-651/SPS-5B Practical Wiring Diagram.

Figures 7-65, through 7-67 show component locations.

Figures 7-62, through 7-64 Exploded View Drawings.

**WARNING**

Make sure the Antenna Disabling Switch is in the OFF position, and that the Main Line Switch is pulled before any servicing is begun.

(2) *Removal of Antenna from Mast.*

For Antenna overhaul or major replacements, the unit must be removed from the mast and disassembled on a suitable workbench. The disassembly procedure follows:

(a) Disconnect the power and control cable to the Antenna (at the Antenna).

(b) Remove the 10 screws securing the two waveguide flanges at the base of the Antenna.

(c) Remove the four nuts and bolts securing the feet of the Antenna to the mast.

(d) Using a crane or block and tackle, lift the Antenna from the mounting ring on the mast and lower it to the deck.

(3) *Removal of Reflector and Horn Assembly (See Figure 7-62).*

To remove the reflector and horn assembly in order to perform major repairs and overhaul, the disassembly procedure is as follows:

(a) Remove the lifting hook.

(b) Remove the three pipe plugs.

(c) Loosen the four socket head bolts, found in the holes created by steps (a) and (b).

**Note**

If an Allen wrench of sufficient size and length is not available, it has been found that by cutting off the end of a screw-driver of the correct size, the socket head bolts may be loosened easily.

(d) Remove the horn, by removing the eight screws surrounding the flange at its base.

(e) Remove the two socket head bolts on the outside of the pedestal.

(f) Lift and slide the reflector assembly forward (toward the horn) over the waveguide.

When reassembling, put the four socket head bolts in position before the entire assembly has been slipped over the waveguide.

(4) *Replacement of Antenna Synchro B802 (See Figure 7-65).*

(a) Remove the external synchro cover by loosening the six captive screws around the perimeter of the cover.

(b) Remove the fire leads from the synchro and mark the leads.

(c) Remove the three screws securing the synchro and lift the synchro out of the well.

(d) Remove the nut securing the self-aligning coupler to the end of the synchro shaft and remove the coupler and synchro washer.

(e) To install a new synchro reverse the above procedure, installing a new synchro drive washer.

(f) Each time a synchro is replaced, the entire synchro system must be aligned. Synchro alignment procedures are given in BuOrd Pamphlet #1303, U.S. Navy Synchros.

(5) *Replacement of Antenna Drive Motor B801 (See Figure 7-66).*

(a) Pull the Main Line Switch and turn the Antenna Disabling Switch to the OFF position.



## **SECTION 8**

### **PARTS LISTS**

The parts list section has been corrected by means of the following supplementary tables. Always refer to the appropriate supplementary table for a given item first as it completely supersedes any corresponding listing in the basic table. If no information is shown for a given item then refer to the basic table for the required information.

TABLE 8-3A LIST OF MAJOR PARTS

SYMBOL SERIES	QUANTITY	NAME OF UNIT	TYPE DESIGNATION
1001- 1099	1	TEST SET, RADAR: c/o Indicator, Standing Wave Ratio and carrying case, AN/UPM-79; Raytheon Unit #2561-5004G1.	AN/UPM-79
_____	1	INDICATOR; STANDING WAVE RATIO: IM-120/UPM-79; Raytheon Unit #2561-5001G1.	P -o Radar Test Set AN/UPM-79



TABLE 8-4		TABLE OF REPLACEABLE PARTS	
REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
A1001	Shop Manufacture	PLATE, END: 1/2 hard yellow brass per MIL-B-895; bright silver plated over-all dim. 1-1/2 in. lg, 47/64 in. wide, 1/4 in. deep; bevelled to 1.367 in. max lg, 0.617 in. max wide, 3/16 in. high w/a No. 2-56 NC-2 by 3/16 in. full threaded hole in ea end of bevelled sections; incl 4 equally spaced slots 0.040 in. max wide; Raytheon Part #2561-1012P1.	Holding plate for E1003, E1004
C333	N16-C-33617-4746	CAPACITOR, FIXED, MICA DIELECTRIC: JAN type #CM35C103J; 10,000 mmf $\pm 5\%$ ; 300 V DC; Spec MIL-C-5A; Raytheon Part #235-1008P78.	Coupling, grid V311A
C1001	N16-C048808-9019	CAPACITOR, FIXED, PAPER DIELECTRIC: JAN Type #CP08A1KB105K; working voltage 100V DC, 1.0 mf, $\pm 10\%$ ; uninsulated hermetically sealed tubular metal case, 1-5/8 in. lg by 0.670 in. dia; Spec MIL-C-25A; Raytheon Part #235-1257P263.	Protective by-pass for M1001
CR1001	N16-T-51725	CRYSTAL UNIT, RECTIFYING: JAN Type 1N25; silicon diode; ceramic body, brass base and tip, brass gold plated; over-all dim. 0.820 in. lg, 0.294 in. OD; Spec JAN-1A; Raytheon Part #322-1025P1.	VSWR line rectifier

TABLE 8-4A		TABLE OF REPLACEABLE PARTS	
REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
E1001	N17-C081969-6019	CONDUCTOR, INNER: hard temper beryllium copper per MIL-C-947, condition H; silver rhodium plate heat treat to Rockwell C38 min; over-all dim. 1 in. lg by 0.375 in. max dia, 0.134 in. max dia over body; 4 slots equally spaced one end 3/8 in. deep, other end has 0.060 in. wide by 1/16 in. dia groove 0.030 in. from end; Raytheon Part #2027-1029P2.	P/o waveguide ass'y.
E1002	Shop Manufacture	INSULATOR: Rexolite #1422 material used; over-all dim. 0.436 in. max dia by 0.132 in. max thick; 0.126 in. max dia center hole; Raytheon Part #2027-1009P1.	Insulating washer for indicator
E1003	N16-R040699-1027	RESISTOR, CARD: made from 0.027 in. thick material, 200 ohms, $\pm 10\%$ per square as purchased from International Resistance Co., Phila. Pa.; over-all dim. 2.750 in. lg. 0.617 in. max wide, angular cut from 0.400 in. at one end to 0.032 in. other end; cemented to end plate, A1001; Raytheon Part #2561-1013P1.	P/o end plate ass'y. A1001
E1004	N16-R040699-1117	RESISTOR, CARD: made from 0.027 in. thick material, 400 ohms, $\pm 10\%$ square as purchased from International Resistance Co., Phila, Pa.; over-all dim. 2.750 in. lg, 0.617 in. max wide, angular cut from 0.400 in. at one end to 0.032 in. other end; cemented to end plate, A1001; Raytheon Part #2561-1013P2.	P/o end plate ass'y. A1001
E1005	For Replacement Use SNSN N17-T059591-6929	TERMINAL: hermetically sealed; Kovar metal body, hard glass insulation; fused electro-tinned plated; 3 amp current capacity, rms test voltage 1000 at 90 per cent humidity at sea level; over-all dim. 0.339 in. max lg by 0.125 in. body dia; 0.175 in. dia mounting flange; Electrical Industries, Inc., Type AAA-30W-SS Modified; Raytheon Part #227-1227P1.	



TABLE 8-4A		TABLE OF REPLACEABLE PARTS	
REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
E1006	N17-T059591-6929	TERMINAL: hermetically sealed; Kovar metal body, hard glass insulation; fused electro-tinned plated, 3 amp current capacity, rms test voltage 1000 at 90 per cent humidity at sea level; over-all dim. 0.400 in. max lg by 0.125 in. body dia. 0.175 in. dia mounting flange; Electrical Industries, Inc., Type AAA-30W-SS Modified; Raytheon Part #227-1227P2.	
E1007	N16-W021998-1127	WAVEGUIDE ASSEMBLY: c/o two sections of waveguide w/joining elbow 2 brackets, housing and crystal seat, tuning seat and choke insert; assembly silver brazed and bright silver plated; approx over-all dim. 7 $\frac{3}{32}$ in. lg, 2-1/2 in. wide, 3-5/16 in. high; bracket mounted; marked "1N25" and "CR1001" in 1/8 in. high characters; Raytheon Part #141-6819G1.	P/o indicator ass'y.
E1727	N17-L-76733-1106	DIAL LIGHT ASSEMBLY c/o: E1728 CAP, LAMPHOLDER E1729 LENS, DIAL LIGHT E1730 NUT, DIAL E1731 WASHER 1704 LAMP, INCANDESCENT X1704 LAMPHOLDER Raytheon Part #2428-5001G1.	Panel lamp
E1728	N16-S-118401-0319	CAP, LAMPHOLDER: brass, black nickel plated; irregular shape; 23/32 in. lg. by 5/8 in. dia.; 5/16 in. -32 / NS-2 thread by 3/16 in. lg one end, shank reduced to 1/16 in. dia. over 1/8 in. of lgth; knurled cap; P/o E1727; Raytheon Part #2428-1001P1.	P/o E1727
E1729	N17-L-250952-0285	LENS, DIAL LIGHT: pure acrylic plastic per MIL-P-5425A, painted one coat white then 4 coats black; irregular shape, 1-3/8 in. lg., 15/16 in. high, 3/16 in. thick; marked "RNG" and "YDS" in white 1/8 in. high characters; 0.316 in. dia hole centered 5/8 in. from bottom; incl. 2 lock pins 9/16 in. C to C; P/o E1727; Raytheon Part #2428-1004G1.	P/o E1727

**TABLE 8-4**

**TABLE OF REPLACEABLE PARTS**

REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
E1730	For Reference Only	NUT, DIAL LIGHT: yellow brass, black nickel plated; 5/8 in. hex by 3/16 in. thick; 15/32 in. -32 NS-2 thread; has 6 equally spaced slots 0.070 in. max wide by 3/32 in. deep square w/flats; P/o E1727; Raytheon Part #2428-1002P1.	P/o E1727
E1731	For Reference Only	WASHER, black neoprene, 40-50 durometer; 1/2 in. OD; 5/16 in. ID, 1/32 in. thick; P/o E1727; Raytheon Part #2428-1003P1.	P/o E1727
E1732		Same as E1729	
H1001		NUT, SELF-LOCKING, HEXAGON: 1/2 hard free cutting yellow brass per MIL-B-895; bright silver plate; 3/8 in. high by 9/16 in. across hex flats; 3/8 in. -32 NEF-2 thread, 1/4 in. dia hole at top; Raytheon Part #2561-1014P1.	Cal.adj. tightening nut
H1002	Shop Manufacture	SCREW, MACHINE: SS, passivated; 1/2 in. dia knurled head 3/16 in. high; over-all lgth 1-3/8 in. ; No. 6-32NC-2 thread over 1-1/8 in. lgth; marked "CAL" on head in 1/8 in. high characters; Raytheon Part #2561-1020P1.	Calibration adjusting screw
H1003	Low Failure item, if required, requisition from ESO referencing NavShips 900, 180A	CATCH, SPRING LOADED: c/o SS strike and catch, both painted gray; catch has compression of 60 lb load at 1/8 in. max deflection; over-all dim. 2-47/64 in. lg, 1-5/64 in. wide; 2 holes ea in catch and strike for No. 6-32NC-2 screws, 9/16 in. C to C on catch, 5/16 in. C to C on strike; Corbin Cabinet Lock Division, #15834-SS painted; Raytheon Part #373-1049G4.	Case Cover catch
H1004		HANDLE: annealed SS, sandblast then black passivate; over-all dim. 3/8 in. dia rod, 4-3/8 in. lg, 1-9/32 in. high; mounts by 2 No. 10-24 NC-2 threaded holes 3/8 in. deep, one each end; Raytheon Part #231-1045P4.	Case handle



TABLE 8-4A		TABLE OF REPLACEABLE PARTS	
REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
H1005	For Replacement use Fed. Stk. #G5340-223-4176	HINGE: leaf aluminum 5052-H34, anodized per AN257-P4-7200, pin non-magnetic, SS passivated; over-all dim. 7-1/2 in. lg, 1-1/2 in. wide, 0.170 in. high; 5 mounting holes, 0.201 in. max dia, in ea leaf 1-5/8 in. between ctrs in ea row 7/8 in. apart; hinge pin 1/4 in. shorter than hinge, loops one-half closed; non binding; Ray. Part #2561-1009P1.	Case lid hinge
H1006	For Replacement use Fed. Stk. #G5310-265-7968	NUT, WING: forged steel, No. 8-32 NC-2 thd size dim. 13/16 in. wing spread, 7/16 in. wing height, 0.168 in. body height, 0.415 in. body dia, 0.238 in. between wings; Sharon Bolt and Screw, no Number; Raytheon Part #203-1051P3.	Holding nuts for ind. in case
I704	N17-L-6543-174	LAMP, INCANDESCENT: AN Type #AN3140-328; single contact, midget flange base; T-1-3/4 clear bulb; 6 V at 0.20 amps.; GE #328; Raytheon Part #277-1011P2.	P/o E1727
M1001	N17-M032374-6249	METER, MICROAMMETER: 0 to 50 ua DC, shaded pole movement; sealed ruggedized, coil resistance 1520 ohms, $\pm 20\%$ special scale calibrated from 1.0 to infinity, with markings of 1.5, 2, 3, 5 and 10 between; over-all dim. 2.630 in. max high by 3.51 in. max dia; flush mounting w/three 0.150 in. dia holes equally spaced on 1.58 in. radius; hardware incl; two term.; scale marked "Voltage Standing Wave Ratio"; Weston Electrical Instrument Corp.; "with special scale" Raytheon Part #45-5106P1.	Standing wave ratio indicator
O1001	For Replacement use SNSN N17-C200867-0876	CAP ASSEMBLY: c/o cap, 4-1/2 in. bead chain and bead couplings; knurled brass cap, silver rhodium plated, 5/8 in. dia by 9/32 in. high w/1/2-18NEF-2 thread, 0.149 in. hole top coupling; Raytheon Part #1756-5007G2.	Cap. to retain CR1001
O1002	For Replacement use SNSN N16-K702781-0173	KNOB, ROUND: fastens w/two set screws 90 deg apart; knurled; black Tenite, matte finish; max over-all dim. 0.803 in. lg by 1.135 in. dia; dial skirt w/white arrow; accom 1/8 in. shaft vaporetched; Raytheon No. 70-3-1G; Raytheon Part #231-1055G9.	Control knob for R1001



TABLE 8-4A

TABLE OF REPLACEABLE PARTS

REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
O1003	For Replacement Use Fed. Stk. #G5340-355-4864	BUMPER, RUBBER: Buna "S" synthetic rubber, black w/No. 8-32 NC-2 threaded stud 7/32 in. lg; over- all dim. 3/4 in. dia by 9/16 in. high; Atlantic India Rubber Works, Inc., Part No. 255; Raytheon Part #359-1049P1.	Case protective bumpers
O1004	Shop Manufacture	GASKET: material black Buna "S" 40-50 durometer; over-all dim. 29-3/16 in. lg, 19/32 in. high, 5/16 in. deep; lgth cutout as follows; one end 3-1/2 in. lg by 11/32 in. deep, other end 3-13/16 in. lg by 11/32 in. deep and two 5/8 in. lg by 1/8 in. deep cutouts, one 10-7/8 in. from end, the other 17-3/8 in. from same end; Raytheon Part #2561-1008P1.	Cover gasket
O1005	Shop Manufacture	GASKET: material black Buna "S" 40-50 durometer; over-all dim. 29-3/16 in. lg, 19/32 in. high, 5/16 in. deep; cut one end over 3-1/2 in. lgth by 11/32 in. deep, other end over 3-13/16 in. lgth by 11/32 in. deep; Raytheon Part #2561-1008P2.	Cover gasket
O1006	Fabricate locally from bulk material under Fed. Stk. #G5330-244-0193	GASKET: black rubber, Type RS409 per MIL-R-3065; over-all dim. 3-1/2 in. lg, 3/8 in. wide, 1/4 in. thick; Raytheon Part #2561-1004P1.	Indicator hold-down gaskets
O1007	Fabricate locally from bulk material under Fed. Stk. #G5330-244-0191	GASKET: black rubber, type RS409 per MIL-R-3065; over-all dim. 1-1/2 in. dia, 1 in. wide, 1/16 in. thick; 3/16 in. dia axial hole; semi-circular shape, 1/4 in. greater than half circle; Raytheon Part #2561-1003P1.	Crystal holder gasket
O1008	Fabricate locally from bulk material under Fed. Stk. #G5330-244-0197	GASKET: black rubber, type RS409 per MIL-R-3065; over-all dim. 4 in. sq. by 1/2 in. thick; incl 3-9/16 in. dia axial hole; Raytheon Part #2561-1005P1.	Meter protective case gasket



TABLE 8-4A		TABLE OF REPLACEABLE PARTS	
REFERENCE DESIGNATION	STOCK NUMBER	NAME AND DESCRIPTION	LOCATING FUNCTION
R320	N16-R-50587-435	RESISTOR, FIXED, COMPOSITION: JAN Type #RC20GF823J; 82,000 ohms, ±5%; 1/2 W; Spec MIL-R-11A; Raytheon Part #280-1145P142.	Plate load, V310
R322	N16-R-50740-380	RESISTOR, FIXED, COMPOSITION: JAN Type #RC20GF274J; 0.27 megohms, ±5%; 1/2 W; Spec MIL-R-11A; Raytheon Part #280-1145P160.	Grid bias V311
R323	N16-R-049660-0438	RESISTOR, FIXED, COMPOSITION: JAN Type #RC20GF221J; 220 ohms, ±5%; 1/2 W; Spec MIL-R-11A; Raytheon Part #280-1145P49.	Cathode, V311
R382	N16-R-50317-437	RESISTOR, FIXED, COMPOSITION: JAN Type #RC20GF133J; 13,000 ohms, ±5%; 1/2 W; Spec MIL-R-11A; Raytheon Part #280-1145P114.	Voltage divider grid V311
R1001	For Replacement Use SNSN N16-R087517-2429	RESISTOR, VARIABLE: composition 5000 ohms, ±10%; 1/2 W; linear taper; clock wise rotation; 5/8 in. lg flatted shaft; 3 solder lug terminals; over-all dim. less terminals 1 in. lg by 3/4 in. dia; non-turn device located on 3/8 in. radius at 9 o'clock; Spec MIL-R-94A; Chicago Telephone Supply Corp., Series 65; Raytheon Part #240-1204P5.	Sensitivity adj. for M1001
V311	N16-T-56196-90	TUBE, ELECTRON: beam power amplifier; reliable; 7 pin miniature; Type 6AN5WA; Raytheon Part #290-1039P3.	Video amp. and C. F. receiver
XI704	For Reference Only	LAMPHOLDER: brass, black nickel plated body and nut, laminated phenolic insulation type PBE-P per MIL-P-3115; over-all dim. excluding locking nut and lockwashers, 1 in. lg. by 15/32 in. dia; 15/32 in. -32 NS-2 by 1/2 in. lg threaded section; 2 brass, tin dipped terminals one end; Dial Light Type #101-3830; P/o E1727; Raytheon Part #281-1100P1.	Socket assembly for indicator I704

